

WASTEWATER TREATMENT AND DESALINATION WITH THE HELP OF MEMBRANE SEPARATION PROCESSES-A SHORT AND FAR-REACHING REVIEW

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ABSTRACT:

Wastewater treatment and environmental engineering are the burning issues and mind-boggling issues of our human society. Pure water is of urgent and veritable need of our human society. Our main vision and objective of this pursuit is to bring to the forefront the importance of reverse osmosis or other membrane separation processes in the field of wastewater treatment. Of the membrane separation processes, reverse osmosis membrane technology has developed over the past 40 years to a 44% share in world desalting production capacity, and an 80% share in the total number of desalination plants installed worldwide. Desalination is the visionary process in the field of membrane separation processes. The use of membrane desalination has increased as materials have improved drastically and cuts have decreased. In today's world reverse osmosis membranes are the leading and emerging technologies for new desalination installations, and they are applied to a wide variety of salt water resources using pre-tailored treatment procedures and membrane system design. The visionary applications of membrane separation processes has made it of primary importance in wastewater treatment and sea water desalination. This article presents the visionary importance of membrane separation processes in sea water desalination, effluent treatment and wastewater treatment.

Keywords: wastewater, water, desalination, membrane, separation.

1.0 Introduction:

The U.S. Geological Survey found that 96.5% of earth's water is located in seas and oceans and 1.7% of Earth's water is located in the ice-caps. Approximately 0.8% is considered to be fresh

water. The remaining percentage is made of brackish water, slightly salty water found as surface water in estuaries and as groundwater in salty aquifer. Water scarcity and shortages have plagued many communities and human society have long searched for a solution to earth's

meager fresh water supplies. Thus desalination is not a new idea or concept; the idea of turning saltwater into fresh water and purified water has been developed and used for centuries [1,2].

In today's world, the production of potable water has become a serious worldwide concern; for many communities, projected population growth and demand exceed conventional available water resources. Over 1 billion people are without clean drinking water and approximately 2.3 billion people (41% of the world population) live in regions of water shortages and water scarcity [3]. Over 1 billion people are without clean drinking water and approximately 2.3 billion people (41% of water population) live in regions of water shortages. For most, solutions such as water conservation and water transfer or dam construction are not sufficient methods to cope with increasing demand and, in many cases, decreasing supply. Traditional and conventional fresh water resources such as lakes, rivers and groundwater are overused or misused; as a result, these resources are either diminishing or become saline. As countries and nations continue to develop and cities expand, few new water resources are available for human sustenance. As a result, solutions such as water reuse, water recycling and salt water desalination have emerged as the key hallmarks of environmental engineering.

2.0 Water engineering and vision of membrane separation processes:

Water resources and drinking water supply are slowly depleting in our day to day life. It has become a burning issue in human society and a challenging problem to an environmental engineer and environmental scientist. Water reuse and water desalination is the major and prime solution thus bringing into forefront the importance of membrane separation process. Man's as well as a scientist's vision is innovative, exalting and far-reaching. Scientific rigour has opened up the windows of intuition and

innovation in the discovery of membrane separation processes. The journey into the path of innovation is ground breaking. Membrane separation has an umbilical cord with water reuse and water desalination. The potential of membrane separation process with water desalination is tremendous and the vision lies ahead with immense optimism.

3.0 Industrialization, survival and vision of wastewater engineering:

Man's scientific vision is wide and versatile. Industrialization has led to problems of our mankind such as water shortage. The glimpses of water research has shown the scientific rigour and the scientific hardship. Due to rapid industrialization and growth, there is an increased opportunity for grey water reuse in developing nations such as India. Although India occupies only 3.29 million km² geographical area, which forms 2.4% of the world's land area, it supports over 15% of world's population. The population of India as of March 31, 2011 was 1,210,193,422 persons (Census, 2011). India also has a livestock population of 500 million which is about 20% of world's total livestock. So here is the vision of wastewater engineering and the importance of environmental engineering. Pure clean water is the ultimate requirement of human survival. The vision of membrane separation techniques lies ahead with economy in mind. It is creating visionary wonders [4].

4.0 Importance of membrane separation processes and reverse osmosis:

The ultimate need of human society is drinking water. The urge of scientific endeavour is towards clean water. Pure, clean water is an absolute must for survival. Water resources used by humans for various domestic purposes such as drinking, cooking food, washing clothes, baths, recreations, flushing clothes, and car washing. Water is also used for various industrial purposes, agricultural purposes, power generation, fishing

and so forth. The availability of water is inadequate to meet the growing demands of human survival. The conventional water sources, like rivers, lakes, ponds and so forth in the form of surface water are not fully dependable because of these are rain fed.

The crucial role groundwater plays as a decentralized source of drinking water for millions of rural and urban families cannot be overstated. However, due to rapid and tremendous growth of population, urbanization, industrialization and agricultural activities, groundwater resources are under severe stress and of serious concern. There is a growing and inevitable concern on the deterioration of groundwater quality due to geogenic and an anthropogenic activity.

So the vision towards membrane separation procedures such as reverse osmosis [7]. A scientist's vision and endeavour will unfold the hidden truth of these procedures. Membrane processes such as reverse osmosis(RO), nanofiltration(NF) and electrodialysis(ED) have drawn more attention and are considered visionary because of their strong separation capabilities and exhibiting a great potential for the treatment of water worldwide. In recent years, RO membrane technology is the leading technology for new desalination installations and has developed for both brackish and seawater applications [5].

5.0 RO Process : Basic Principle:

RO is a physical process that uses the osmosis phenomenon, that is, the osmotic pressure difference between the salt water and the pure water to remove the salts from water. RO is a pressure-driven membrane process where a feed stream flows under pressure through a semi-permeable membrane, separating two aqueous streams, one rich in salt and other poor in salt. Water will pass through the membrane, when the applied pressure is higher than the osmotic pressure, where salt is retained. As a result, a low

salt concentration permeate stream is obtained and a concentrated brine remains at the feed side[5]. So it has become an inevitable need to apply reverse osmosis in desalination and wastewater treatment procedures.

6.0 Vision and doctrine of membrane separation procedures:

A scientist's vision is unlimited and versatile. Hope and scientific endeavour will open up new windows of innovation in years to come. Due to its separation capabilities, membrane separation processes can bring effective impact in the question of human survival. Water engineering will be an eye opener to other environmental engineering procedures. The world of unknown will unfold to an age of optimism. Thus membrane science will target towards greater sustainability and greater vision [6].

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